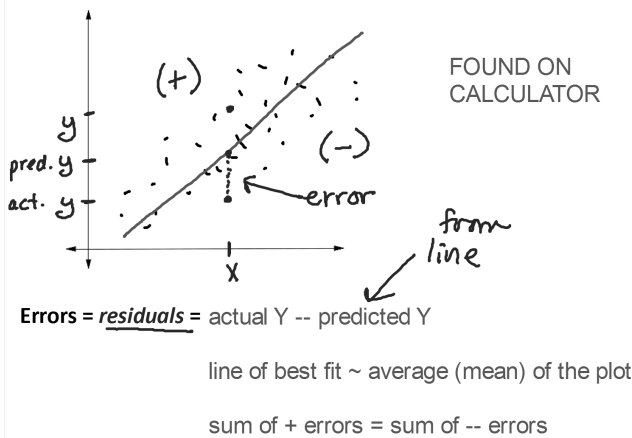


## Chapter 8:

### Line of Best Fit



### Linear Regression Line:

- Describes how... a response variable (Y) changes as an explanatory variable (X) changes (#)

- Used to... predict the value of Y for a given value of X

$$Y = mX + b$$

10 mg

### Most accurate Regression line:

- Called: Least Squares Regression Line (LSR line or LSRL)

- Definition: minimizes... the (errors)<sup>2</sup> of Y

Form:  $\hat{y} = b_0 + b_1x$

hat = sample  
int. = intercept  
slope =  $b_1$

$$b_1 = r \left( \frac{s_y}{s_x} \right) \quad b_0 = \bar{y} - b_1 \bar{x}$$

- always ... passes thru  $(\bar{x}, \bar{y})$
  - not resistant (to outliers) = outliers affect the line a lot!
  - on calculator: STAT -> CALC -> 8:LinReg(a + bx) XLIST, YLIST, Y1
- \*\*note: you get Y1 by going VARS--> YVARS--> FUNCTION --> Y1*

### Calculator Example (using EXA1 and EXA2)

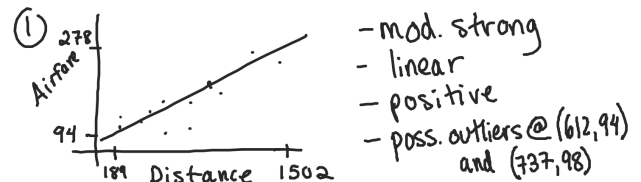
$$(\widehat{2^{\text{nd}} \text{ exam}}) = 24.86 + 0.6702(1^{\text{st}} \text{ exam})$$

$$\hat{y} = 24.86 + 0.6702(x)$$

$x = 1^{\text{st}} \text{ exam}$   
 $y = 2^{\text{nd}} \text{ exam}$

### Complete worksheet 8A

### Worksheet 8A Answers:



②

	mean	Std.Dev.	corr
X	712.667	402.69	0.795
Y	166.92	59.45	

③  $b_1 = r \left( \frac{s_y}{s_x} \right) \quad b_0 = \bar{y} - b_1 \bar{x}$  (no LinReg)

$$\textcircled{3} \quad b_1 = r \left( \frac{S_y}{S_x} \right) = 0.795 \left( \frac{59.45}{402.69} \right) = \boxed{0.1174}$$

$$b_0 = \bar{y} - b_1 \bar{x} = 166.92 - (0.1174)(712.667) = \boxed{83.25}$$

$$\hat{y} = 83.25 + 0.1174x$$

$$\text{Airfare} = 83.25 + 0.1174(\text{distance})$$

$$\textcircled{4} \quad \hat{\text{Airfare}} = 83.267 + 0.1174(\text{dist}) \quad r = 0.795$$

$$\textcircled{5} \quad \hat{y} = 83.267 + 0.1174(370) = \boxed{\$126.70}$$

$$\begin{aligned} \text{Error} &= \text{actual} - \text{predicted} \\ &= 138 - 126.70 \\ &= \boxed{\$11.30} \end{aligned} \quad \begin{array}{l} \text{*predictions on} \\ \text{calculator} \end{array}$$

$$\hat{y} = 83.267 + 0.1174(1502) = \$259.56$$

$$\text{Error} = 258 - 259.56 = \boxed{-\$1.56}$$

$$\textcircled{6} \quad \hat{y} = 83.25 + 0.1174(2842) = \boxed{\$416.85} \quad \swarrow x$$

$$\textcircled{7} \quad \text{Error} = 198 - 416.85 = \boxed{-\$218.85}$$

$$\textcircled{8} \quad \begin{array}{c|c|c|c|c} D & 900 & 901 & 902 & 903 \\ \hline A & 188.90 & 189.02 & 189.14 & 189.26 \end{array}$$

$$\textcircled{9} \quad \$0.12 = \text{slope}$$

$$\textcircled{11} \quad \begin{array}{l} \$12.00 \\ \$11.74 \end{array}$$